The WNT (Weak Nuclear Transmutation) process, which is the basis of the "invention", was developed on a pragmatic basis, without scientific insights having been able to find adequate space.

To try to give a – at least partially plausible – "theoretical" explanation to the pragmatic effect obtained, it seems appropriate to take into direct consideration the main consequences of the "treatment".

In the first place, there are variations in the nature of a significant portion of the nuclides inserted both in "nuclear" terms (i.e. transmutation of an element into another element): for example, by inserting a certain quantity of radioactive cobalt, a the quantity of the same element greatly decreased, while the quantity of stable nickel increased; or in "isotopic" terms: for example, even in the absence of radionuclides, there are appreciable numerical variations between the specific quantities of different isotopes of the same element. There is also an appreciable generation of heat.

In the context of scientific knowledge established to date, it is possible to identify a phenomenon (or rather a connected series of phenomena), β and β-like decays, which create transmutation and, at the same time, generate energy.

To summarize, the essential technical result of the invention is to accelerate the transmutation (in itself "natural") of radioactive materials, reducing or eliminating their emission rate and consequent radiotoxicity. At the same time the process – eminently exothermic – generates a significant energy surplus (which is expressed in the form of calorific energy).

The production of surplus energy is configured as a fatal aspect of the process and the opportunity for exploitation (technical and economic) of the available energy appears obvious. It seems legitimate to say – regardless of the industrial purpose of the application – that the two effects (reduction of radiotoxicity and energy production) are – inevitably – interpenetrated.

We can now ask ourselves if the invention could consist in the implementation of "nuclear" reactions between transition metals and radioactive materials, acting on these elements with an electric field, ultrasonic waves and heating. The answer is, essentially, yes. It is also necessary to remember that the process requires that radioactive materials and transition metals are subjected to a double electrostatic field (one static and one intermittent)[1], ultrasonic waves and heating, while they are contained in a hydrogen environment. pressure.

We want to confirm that radioactive decay itself does not depend on external conditions (temperature, pressure, chemical effects). With regard to this issue, however, it appears necessary to differentiate (or, better, clarify) whether the term "depends" is intended to refer to its own decay activity or its probability and its modal characteristics.

In itself the decay (nuclear as well as isotopic, as already examined) appears as a "natural" phenomenon, determined by the characteristics of each single element. Moreover, a decay can be caused or perturbed by phenomena present in nature (for example, the intervention of cosmic rays). So we can confidently state that, while the effect of decay (or, more precisely, of nuclear

1 The presence - however not strictly essential - of a double electrostatic field, one stable and one intermittent (also electrostatic and with polarity consistent with those of the stable electrostatic field) is motivated by an acceleration of the initiation of the process and by a greater regularity of its development (counteracting phenomena of momentary arrest – "sawtooth" trend – of the process itself).

or isotopic transmutation) does not “depend” on external macroscopic conditions, they can affect the probability of transmutation, its speed and, in summary, on its pragmatic effects.

Let us now see if the essence of the processes that took place in the experiments conducted, whether the exothermic transmutation occurred, can only be defined as a hypothesis.

From an exclusively “scientific” point of view, it seems quite correct to define the essence of the processes as a “hypothesis”, albeit based on previous theoretical studies.

Confirming that the activity carried out was not purely scientific research purposes, but rather the development of a pragmatic procedure aimed at obtaining concrete results with their specific “usefulness”, it should be noted that no tests were carried out aimed at giving a “scientific” explanation the phenomena encountered, while we concentrated on highlighting the concrete effects of the activated processes.

As a consequence of this, in the absence of explicit theoretical explanations (which could not fail to derive from scientific assessments) and exclusively in purely scientific-doctrinal terms, the definition of “hypothesis” can be considered correct. In summary, it could be said that this is a “hypothesis” of explanation of verified phenomena.

Quite different (if you want, the opposite) is the situation where you want to approach the subject in technological-pragmatic (and, prospectively, industrial) terms. In this second case (which, moreover, should be the one logically adopted – as the main point of view, if not the only one – by those who have to evaluate the functionality of an "invention" and not its possible implications on current scientific theories) the term “hypothesis” is configured as totally improper as the experimental evidence (we repeat: technological-pragmatic and unscientific) promote the “hypothesis” to “effect”.

It seems appropriate to avoid making references to research (carried out in the last century) that could give explanations to “unorthodox” phenomena. This even when the well-known researches have been carried out at institutes of great notoriety and by scientists of the highest level: the widespread credulity among the great mass of those who deal with physical subjects is limited not only to the strictest orthodoxy, but demands affirmations that they are configured as “more monarchical than the king”.

We can therefore try – in the absence, as mentioned, of dedicated experiments – to limit ourselves to observing some facts and drawing the logical (and hardly opposed) consequences.

We reiterate that we have not carried out any experiment intended to understand which precise physical principle – known or innovative – is able to produce the speed of transmutations that the experiments performed (eminently technological and not expressly scientific experiments) by us and by third parties have repeatedly highlighted.

Therefore, remaining within the framework of knowledge accepted to date, we must interpret the events as “normal” transmutations (isotopic or nuclear) strongly accelerated with respect to the known decay times. It is not possible to affirm (in the absence, we want to repeat it, of specific experiments that make it possible to create a knowledge base on which to rely to develop hypotheses and theories, in turn to be subjected to experimental verification) that we can find ourselves faced with “artificial transmutations”. What is proven by experiments is that the rate of “natural” transmutations increases more than considerably.

Acceleration refers to some well-known phenomena and their synergy.

1 It is known that microwave exposure causes a phenomenon called "neutron cloud", ie a partial separation (we can say "removal") of the nucleons.

2 Exposure to electrostatic fields tends to polarize the atomic components (electrons, electrically negative and therefore attracted to the positive pole; protons, electrically positive and therefore attracted to the negative pole and neutrons, electrically neutral and therefore unrelated to the polarization phenomenon). It follows that even at the nuclear level a geometric tension is formed between the nucleons.

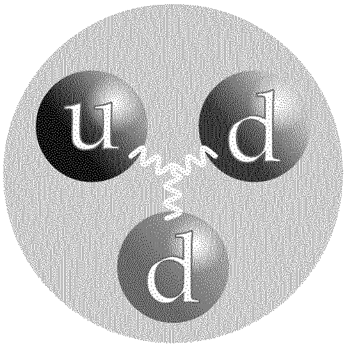
3 The treatment environment is saturated with hydrogen (whose atomic components – in this case only electrons and protons – are under a polarizing effect) which we can consider as a "quasi-ionized" hydrogen, given the forced distancing of its atomic components.

4 The heat produces a strong agitation of "quasi-ionized" hydrogen.

5 The probability that "replacements" of nucleons occur – forced simultaneously by the "neutron cloud" effect and by polarization – becomes enormously more probable than in a state of rest.

6 This can be further confirmed by the fact that, by carrying out the experiment in the absence of ultrasonic waves, the effects occur in much longer times (the "american" case).

Neutron

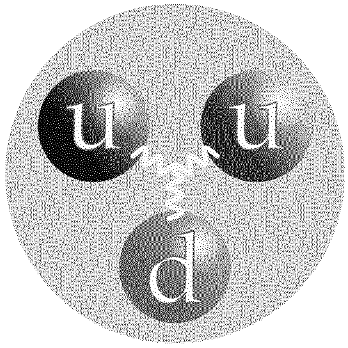


Quark model of the neutron

The neutron is a hadron (compound particle), made up of 1 up quark and 2 down quark (udd). Its electric charge is equal to

$$^{2}/_{3} + (-\,^{1}/_{3} + -\,^{1}/_{3}) = 0$$

Proton



Quark model of the proton

The proton is a hadron (compound particle), made up of 2 up quark and 1 down quark (udd). Its electric charge is equal to

$$2\,^{2}/_{3} + (-\,^{1}/_{3}) = -(e^{-})$$

A quark can change *flavor* only through weak interaction, one of the four fundamental interactions in particle physics. By absorbing or emitting a W boson, each quark of the "up" family (*up*, *charm* and *top*) can become a quark of the "down" family (*down*, *strange* and *bottom*) and vice versa. This flavor transformation mechanism causes a radioactive beta decay process in which a neutron (n) decays into a proton (p), an electron (e^-) and an electron antineutrino (ν_e). This occurs when one of the neutron's down quarks (udd) transforms into an up quark by emitting a virtual W boson which transforms the neutron into a proton (uud). The W boson decays into an electron and an electronic antineutrino.

$$n \rightarrow p + e^- + \nu_e$$ (Beta decay, hadron notation)

$$udd \rightarrow uud + e^- + \nu_e$$ (Beta decay, quark notation)

The β decay is a type of radioactive decay, that is one of the spontaneous nuclear reactions through which radioactive chemical elements are transformed into others with different atomic numbers. The process involves weak nuclear forces and determines the emission of ionizing subatomic particles according to the mass / energy conservation principle.

In the years following the discovery of radioactivity, a different behavior of the particles emitted by radioactive substances was observed during decay. In many cases, the detection instruments showed the presence of trail-like traces: when a magnetic field was applied, the traces coming from some radioactive substances had the curvature facing opposite sides. The rays associated with the oppositely deflected traces were conventionally given the name of *alpha rays* (today the term alpha radiation is more commonly used when speaking of the particles emitted in this case and their effects) and *beta rays* (today beta radiation); the rest took the name of *gamma rays* (now gamma radiation).

The nature of the emitted particles and of the decays is radically different in the three cases. The discovery of the processes that occur within the nucleus and give rise to these decays required considerable research in the early twentieth century. These researches have led to the finding that the trail emitted in the case of beta rays is due to the emission of an electron. The reason why the three types of rays are deflected differently depends on the different electrical charge that the emitted particles have: positive in the case of alpha decay (alpha particles) and β^+ (positrons), negative in the case of β^- decay. (electrons), and neutral in the case of gamma decay (in the case of photons). The first theoretical framework of β decay was made by Enrico Fermi, who in 1933 published his theory of beta decay.[2]

Today the decay and the radiation are classified as beta (β) no longer on the basis of the charge of the emitted particle, but on the basis of the particular type of nuclear process that occurs through weak interaction. Normally, the involved neutron is found in a nucleus of an atom and what occurs, in addition to the emission of the two particles, is that the atom is transformed into that of another element, that is, into the one with atomic number (*Z*) following. The sum of protons and neutrons (called mass number *A*) inside the nucleus remains unchanged. This decay is referred to as the β^- decay (it is defined *minus* because the emitted electron has a negative charge).

This decay is also observed:

$$p \longrightarrow n + e^+ + \nu_e$$

in which a *bound* proton transforms into a *bound* neutron, a positron and a neutrino. The positron, which is the antiparticle of the electron, has a positive charge; therefore, this decay is indicated with the term β^+.

According to current accepted theories, β decay can occur in two ways:

The β^- decay is a typical decay of nuclei having an excess of neutrons with respect to their stable isobars; the nucleus is transformed into its isobar with the simultaneous emission of an electron and an electronic antineutrino according to the law

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2 Fermi E.; "Tentativo di una teoria dei raggi β"; in *La Ricerca Scientifica*, vol. 2, n. 12, 1933. Fermi E.; "Tentativo di una teoria dei raggi β"; in *Il Nuovo Cimento*, vol. 11, n. 1, 1934, pp. 1-19. Fermi E.; "Versuch einer Theorie der beta-Strahlen. I"; in *Zeitschrift für Physik*, vol. 88, 1934, p. 161.

$$A(Z,N) \longrightarrow A(Z+1,N-1) + T_A + m_e + T_e + E_{\bar{\nu}_e}$$

For the principle of energy conservation applied to this type of decay, it is possible to write the following relationship

$$M(A,Z) = M(A,Z+1) + T_A + m_e + T_e + E_{\bar{\nu}_e}$$

where is it:

and $M(A,Z+1)$ are the masses of the parent nucleus and of the child nucleus respectively;

and T_e are the kinetic energies of the nucleus and the electron;

$E_{\bar{\nu}_e}$ is the energy of the antineutrino emitted.

By moving the masses to the left of the equation and keeping the energies to the right, it is possible to derive the energetic condition at which the β^- decay occurs:

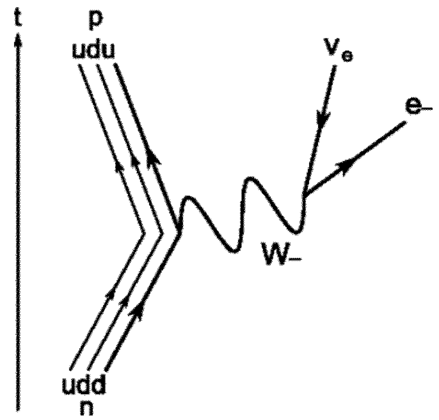
$$Q_{\beta^-} = M(A,Z) - M(A,Z+1) - m_e = T_A + T_e + E_{\bar{\nu}_e} > 0$$

where Q_{β^-} is the liberated energy. Therefore, for the decay to occur, the liberated energy must be positive. This for example happens in the neutron decay: a neutron, free or not, decays into a proton pair electron plus an electronic antineutrino according to the relation:

$$n \longrightarrow p + e^- + \bar{\nu}_e$$

which is possible from an energetic point of view since $Q_{\beta^-} = m_n - m_p - m_e = 782\text{keV} > 0$. The proton remains in the atomic nucleus, while the other two particles are emitted. An example of β^- decay is the decay of the cobalt-60 radionuclide into the nickel-60 nuclide, which follows this pattern:

$${}^{27}_{60}Co \longrightarrow {}^{28}_{60}Ni + e^- + \bar{\nu}_e$$



Feynman diagram of beta decay (conversion of a neutron to a proton: β^-) with respect to time.

The β^+ decay is a typical decay of nuclei having a neutron defect with respect to their stable isobars; the nucleus is transformed into its isobar with the simultaneous emission of a positron and an electron neutrino according to the law

$$A(Z,N) \longrightarrow A(Z-1,N+1) + e^+ + \nu_e$$

Still applying the principle of energy conservation to the masses and energies involved in the decay, it is possible to write that

$$M(A,Z) = M(A,Z-1) + T_A + m_e + T_e + E_{\nu_e}$$

where is it:

and $M(A, Z-1)$ are the masses of the parent nucleus and of the child nucleus respectively; and T_e are the kinetic energies of the nucleus and the electron;
E_{ν_e} is the energy of the emitted neutrino.

Similarly to the β^- case, by moving the masses to the left and keeping the energies to the right, it is possible to write the energetic condition at which the β^+ decay occurs:

$$Q_{\beta^+} = M(A, Z) - M(A, Z-1) - m_e = T_A + T_e + E_{\nu_e} > 0$$

where Q_{β^+} is the released energy. Also in this case, decay is possible when the released energy has a positive balance.

An example of β^+ decay is the decay of the fluorine-18 radionuclide into the stable oxygen-18 nuclide, which follows this pattern:

$$^{18}_{9}F \longrightarrow {}^{18}_{8}O + e^+ + \nu_e$$

The so-called *electron capture* is characterized by the capture of an electron by the nucleus, resulting in the emission of a monoenergetic neutrino according to the scheme

$$A(Z, N) + e^- \longrightarrow A(Z-1, N+1) + \nu_e$$

Although it is not a decay process, it is a more common stabilization process of atoms than β^+ decay.

By applying the principle of conservation of energy to the masses and energies involved in the decay, it is possible to write that

$$M(A, Z) + m_e = M(A, Z-1) + T_A + E_{\nu_e}$$

where is it:
$M(A, Z)$ and $M(A, Z-1)$ are the masses of the parent nucleus and of the child nucleus respectively;
T_A is the kinetic energy of the nucleus;
E_{ν_e} is the energy of the emitted neutrino.

Moving, as in the previous cases, the masses to the left and the energies to the right, we obtain the relation:

$$Q_{CE} = M(A, Z) - M(A, Z-1) + m_e = Q_{\beta^+} + 2m_e = T_A + E_{\nu_e} > 0$$

This means that the electronic capture is favored, with respect to the β^+ decay, of the energy equivalent of two electronic masses, that is 1022 keV.

In the following, we will speak only of the β^- decay, the most frequent, to the point that we often refer to it with the only name of β decay. However, the same reasoning, with the necessary modifications, is also valid in the case of the β^+ decay and, in some cases, also for the electronic capture. Since neutrinos interact weakly with matter, when Marie Curie first observed this type of decay, she associated it with the emission of an electron alone; it was Enrico Fermi who, following an idea of Wolfgang Pauli, who was trying to resolve an apparent contradiction between the experimental results and the principle of energy conservation, incorporated the neutrino into the theory.

Let us now examine the decay of cobalt-60 according to energy optics.

It should be noted that gamma rays are often produced together with other forms of radiation such as alpha and beta. When a nucleus emits an α or β particle, the resulting nucleus is in an excited state. It can move to a more stable energy level by emitting a gamma photon, in the same way that an electron can move to a lower level by emitting an optical photon. This process is called "gamma decay".

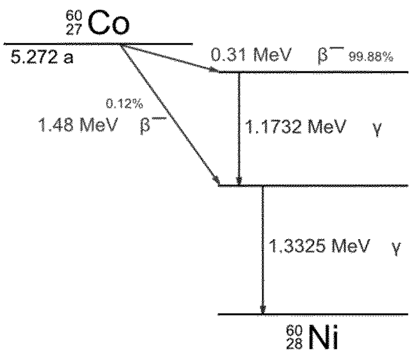
A process of this kind usually has a characteristic time of 10-12 s (and can also occur after a nuclear reaction such as fission, fusion or neutron capture). In some cases these excited states can be more stable than average (they are defined as metastable excitation states) and their decay can take at least 100 or 1000 times longer. These particularly long-lived excited nuclei are called nuclear isomers and their decay takes the name of *isomeric transition*. Some of them also find it easy to measure half-life as they can stay in these excited states for minutes, hours, days and occasionally much more. These states are also characterized by a high nuclear spin. The speed of the gamma decay is also slowed down if the excitation energy is low.

In our case, first a cobalt-60 nucleus decays into an excited nickel-60 through beta decay by emitting an electron at 0.31 MeV. Then the nickel-60 decays into the ground state emitting gamma rays in succession at 1.17 MeV followed by 1.33 MeV. This is the path followed in 99.88% of cases:

$$^{60}_{27}Co \longrightarrow {}^{60}_{28}Ni^* + e^- + \bar{\nu}_e$$

$$^{60}_{28}Ni^* \longrightarrow {}^{60}_{28}Ni + \gamma$$

where $\bar{\nu}_e$ is the electronic antineutrino.



Cobalt-60 decay scheme

In some cases the gamma emission spectrum is quite simple, while in other cases it can also be very complex.